Title: Play It

Brief Overview:

The purpose of this unit is to teach students how to use measurements of central tendency and data summary models to analyze trends and make decisions. The students will make recommendations for a hypothetical new radio station.

Links to NCTM 2000 Standards:

- **Mathematics as Problem Solving, Reasoning and Proof, Communication, Connections, and Representation**
  These five process standards are threads that integrate throughout the unit, although they may not be specifically addressed in the unit. They emphasize the need to help students develop the processes that are the major means for doing mathematics, thinking about mathematics, understanding mathematics, and communicating mathematics.

  Students will use problem-solving strategies to decide what kind of music should be played at a new radio station. They will use reasoning skills to make conclusions from data samples. Students also will write persuasive arguments and recommendations based on the performed investigation and will support their arguments with graphical displays. Last of all, they will connect the statistical methods they have learned in the classroom to the real world activities of market researchers and represent summarized data in graphical form.

- **Data Analysis, Statistics, and Probability**
  Students will analyze and interpret data summaries and statistics. They will produce graphical, verbal, and numerical representations of survey data. They also will interpret these representations of sample populations and make predictions about the larger population.

Links to Maryland High School Mathematics Core Learning Units:

Functions and Algebra

- **1.1.1**
  Students will recognize, describe, and extend patterns and functional relationships that are expressed numerically, algebraically, and geometrically.

- **1.1.2**
  Students will represent patterns and functional relationships in a table, as a graph, and by mathematical expression.

Data Analysis and Probability

- **3.1.1**
  Students will design and conduct an investigation that uses statistical methods to analyze data and communicate results.

- **3.1.2**
  Students will use the measures of central tendency and variability to make informed conclusions.

- **3.2.1**
  Students will make informed decisions and predictions based upon the results of simulations and data from research.

- **3.2.3**
  Students will communicate the use and misuse of statistics.

Grade/Level:

Grades 8-12; Pre-Algebra, Algebra 1, Integrated Algebra and Geometry
Gifted/Talented Grades 6-8

Duration/Length:

3 block periods (90 minutes each)

Prerequisite Knowledge:

- Students should be able to read and interpret data displays.
- Students should be familiar with the concepts of mean, median, and mode.

Student Outcomes:

Students will be able to:

- collect and summarize survey data.
- interpret data summaries in order to make conclusions and predictions.
- determine mean, median, and mode from a set of data they have collected.
- use measures of central tendency to make predictions and recommendations.
- express limitations of data summaries and statistics.

Materials/Resources/Printed Materials:

- Warm-up 1
- Worksheets 1, 2, 3, 4
- Overhead Master that accompanies Worksheet 2
- Instructions for graphing histograms on TI-83
- TI-83 graphing calculator

Development/Procedures:

The development of this unit proceeds as follows:

Day 1:

- Warm-Up 1 gives students basic skills practice in determining central measures and interpreting simple data summaries.
- In Activity 1, students will use Worksheets 1 and 2 to organize and interpret the class' own responses to survey questions. This activity challenges students to think about what kinds of data summaries and statistics are appropriate for a given set of data. This activity also requires that students use the graphing calculator to represent the summarized data in a graphical display. Activity 1 ends with a large group discussion in which the instructor introduces the unit project
- Introduction of Unit Project: A group of investors is planning on starting up a new radio station to be broadcast in the geographic area that includes your school district. The format will be geared to teenagers and young adults. We have been given the task of determining what kind of music should be played. In addition, the station must sell advertising time, so the investors want to know peak listening times (why?). Finally, they want to approach retailers or places of commerce (i.e., malls) that are frequented by students. Your job is to convince a retailer that advertising on this radio station would be a wise business decision.
- Homework Day 1: The teacher and students will discuss what data must be gathered for the unit project and how the collection should be completed. The students will complete the Worksheet 3 (survey) for homework.

Day 2:

- Worksheet 4: Students will organize, summarize, and analyze the data they collected for the unit project. They will work in cooperative groups to complete the tasks on this worksheet.

Day 3 (Assessment):

- Students will be assessed on what they have learned with selected response, brief constructed response, and extended constructed response tasks.

Assessment:

The assessment is in two parts. The first includes tasks that assess how well students have learned the vocabulary, skills, and reasoning processes of data analysis. The second is an extended constructed response that asks students to integrate data analysis, reasoning, and communication to support a conclusion. The students must be able to use the data summary from the unit project to complete the extended response portion.

Extension/Follow Up:

Students can research national music trends either in periodicals or on the internet, compare the results of their survey with national or global statistics, and explain why the results are different (for example, national samples include larger sample size and people of all ages and geographic locations).

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Teacher Notes
Day 1

Activity One

Description: This activity is designed as a simple application of data analysis. Students will collect data, display it, and determine central tendency.

Teacher should pick two surveys to do with the class fromWorksheet 1 with 12 survey questions. Surveys P1-P6 collect preference data, and surveys N1 – N6 collect numeric data. Select a preference survey and a numeric survey and record the student responses on the board.

Break into cooperative work groups.

Ask students to complete Worksheet 2 in cooperative groups using the two surveys on the board.

An overhead master is provided for the option of asking students to display their work on an overhead transparency for class discussions.

Discuss the students results, perhaps using overhead transparencies on which students have displayed their data summaries and measures of central tendency. In particular, talk about the difference in types of data and how each type can be summarized. Discuss the effect of outliers (using vocabulary appropriate to the students.)

Summary:

What types of data can be represented in a histogram? Circle graph? Bar graph?
Histogram—numeric data. Circle and Bar graphs non-numeric data.

On which types of data can you always compute all three measures of central tendency?
Numeric data.

What are the limitations of data analysis? ***Sample size, randomness of sample, the way questions are asked or what choices are offered to respondents.***

What are the limitations of making predictions or conclusions for a larger population from data gathered from sample populations? ***Does the sample accurately represent the larger population? In other words, does the sample include all of the attributes of the larger population?***

Teacher Notes (continued)
Unit Project

Lead a large group discussion explaining that groups will be helping to develop a new radio station. Some decisions need to be made to assist management in deciding on the focus of the radio station.

Each group must solve two main problems:

1. First, the radio station can afford to purchase 200 CDs initially. What types of CDs should be purchased and how many of each type? Lead a discussion about conducting a survey. Ask the students if it makes a difference how the questions are asked. Get the students to agree that we need to limit the choices offered on the survey. Lead the students to include type of music (choose 5-8 types) and peak listening times. These choices should be recorded on Worksheet 3, the survey worksheet.

2. Second, the station needs to sell advertising time. Students should list possible local retailers who may benefit from advertising time at this radio station. Choose the top two as the stores to use in the survey. Record on Worksheet 3.

    a. In order to convince retailers that teenagers shop at their businesses, information needs to be collected on how often teenagers shop at these places and how much they spend. Lead students to include this in the survey.

    b. Eventually, each group must write a letter persuading a merchant to advertise on this radio station. Students must also suggest a time of day that the ad may be most beneficial.

3. Instruct students to complete survey on Worksheet 3 for homework.

Data Analysis
Day 2

1. Work groups gather to complete Worksheet 4.

2. Large group discussion: Bring the groups together and discuss the data collected. Collect aggregate data from each group. Possible discussion topics:
    a. Summarize small group work.
    b. What type of music was most popular?
    c. What is the peak listening time?
    d. Is there a correlation between type of music listened to and listening time of day?

Warm-Up 1

Directions for questions 1-3: Find the mean, median, and mode of the following sets of data.

1) 20, 24, 15, 41, 30, 40, 32, 20

mean = ____
median = ____
mode = ____

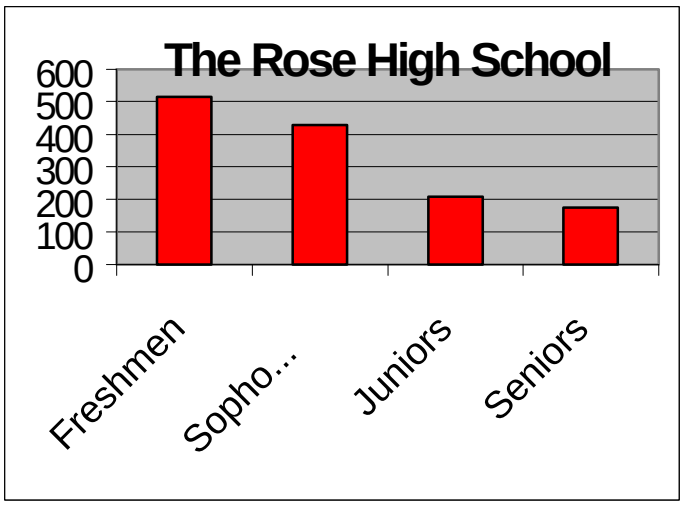
2) 63, 71, 79, 81, 64, 79, 85, 92, 87

mean = ____
median = ____
mode = ____

3) 78.3, 92.4, 73.6, 77.1, 88.5, 101.8,

mean = _____
median = _____
mode = _____

For questions 4-5 use the following graph to answer.



4) Estimate the number of sophomores. _____

5) Estimate the mode for the set of data. _____

Warm-Up 1 *KEY*

Directions for questions 1-3: Find the mean, median, and mode of the following sets of data.

1) 20, 24, 15, 41, 30, 40, 32, 20

mean = **27.75**
median = **27**
mode = **20**

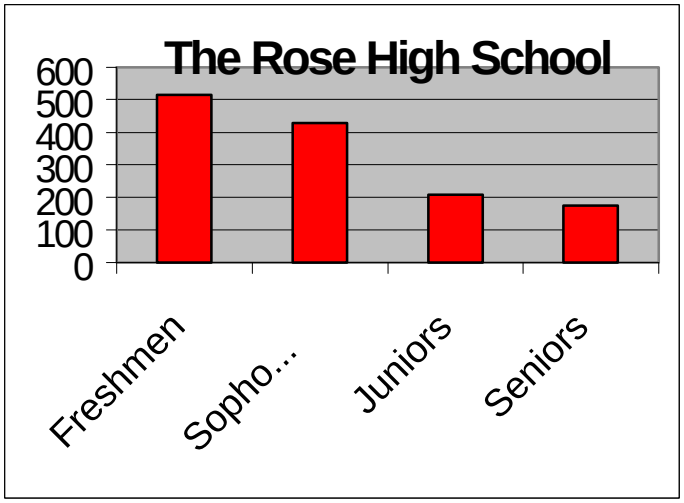
2) 63, 71, 79, 81, 64, 79, 85, 92, 87

mean = **77.89**
median = **79**
mode = **79**

3) 78.3, 92.4, 73.6, 77.1, 88.5, 101.8,

mean = **85.28**
median = **83.4**
mode = **NONE**

For questions 4-5 use the following graph to answer.



4) Estimate the number of sophomores. **400**
5) Estimate the mode for the set of data. **310**

Worksheet 1

P-1 Your favorite brand of sneakers (tennis shoes) Nike Adidas Reebok Other	***P-2 Favorite type of music*** Hip Hop (Rap) R&B House/Pop (Dance) Country Rock Other
P-3 Favorite Subject Mathematics Science English Social Studies Physical Education Art/Music	***P-4 Favorite Sports*** Football Basketball Baseball Field Hockey Lacrosse Golf
P-5 Favorite Flavor of Ice Cream (circle one) Chocolate Vanilla Cherry Vanilla Strawberry Other _____	***P-6 Favorite Soda*** (circle one) Coke Pepsi Sprite Other
N-1 Amount of TV you watched yesterday (round to half hours)	***N-2 Length of your pencil*** (in centimeters)
N-3# of people in your household: ***# of televisions in your home:***	***N-4Shoe size*** (in men's sizes; girls, subtract 2 from your size)
N-5 Amount of time you did homework yesterday (in minutes)	***N-6 Number of siblings*** (include step- and half-)

Worksheet 2 (Page 1 of 2) (Cooperative Group Work)

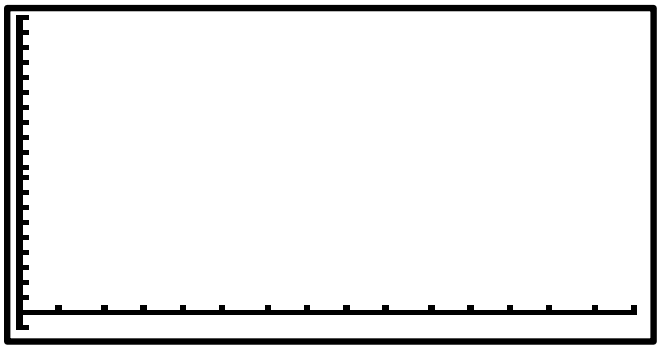
Directions: Use the survey results to answer the following questions:

1. One of your surveys is labeled *P* and one labeled *N*. What is the difference between the two types of data being collected?

2. Look at the student Preference Survey results (the survey from the *P*-set). Can you calculate all three central tendency measures for this data? Why or why not?

3. Calculate any possible central tendency.

4. Make a bar graph of your data. Be sure to label your axes and scale them.



5. Explain whether or not you could represent this data effectively with a circle graph or histogram. (Think: what is the difference between a histogram and bar graph?)

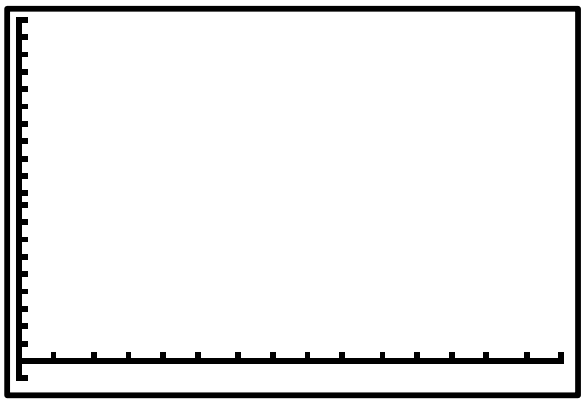
6. What conclusions can you make about the preferences of our class for the survey topic assigned to your group?

7. List some questions that cannot be answered from your data summary.

Worksheet 2 (Page 2 of 2)

8. Can you make any predictions about the general preferences of the students in this school based on your survey results? Address the limitations to making broad generalizations based on this survey.

9. Look at the N-survey results. Tabulate the results of the survey. Display the results as a histogram on a TI-83. Sketch your results. Be sure to label and scale the axes.



10. Calculate the central tendency measures for your data.

11. If you told 3 different people one of each of the three central tendency measures, would they be able to make the same conclusions about the data?

    a. If not, why are the measures so different?

    b. Which do you think is a most accurate representation?

12. List information related to this data that you cannot determine from this data.

13. What conclusions or predictions can you make after analyzing this data?

Key: **Worksheet 2 (Page 1 of 2) (Cooperative Group Work)**

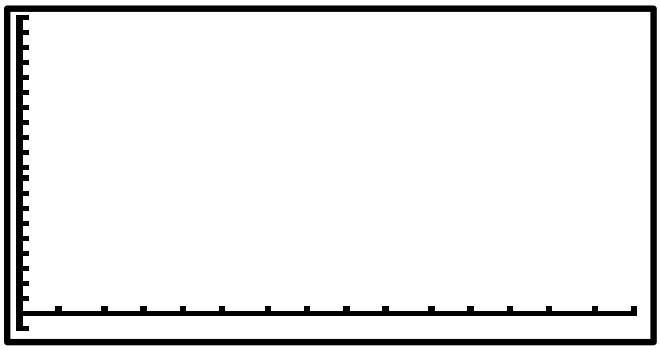
Directions: Use the survey results to answer the following questions:

1. One of your surveys is labeled *P* and one labeled *N*. What is the difference between the two types of data being collected?
   Answer: The N-set collects numeric data and the P-set collects non-numeric data.

2. Look at the student Preference Survey results (the survey from the *P*-set). Can you calculate all three central tendency measures for this data? Why or why not?
   Answer: No central measures are usually possible with non-numeric data. You may be able to determine the mode of the data, which is really the instance of highest frequency.

3. Calculate any possible central tendency.
   Answer: Varies with student data collected. Mode is the only possible measure that can be determined.

4. Make a bar graph of your data. Be sure to label your axes and scale them.
   Answers vary with student data. Look for labels, scaling and that the sum of the bars = the number of students in the class.



5. Explain whether or not you could represent this data effectively with a circle graph or histogram. (Think: what is the difference between a histogram and bar graph?)
   Answer: Circle graph only. A histogram summarizes numeric data only.

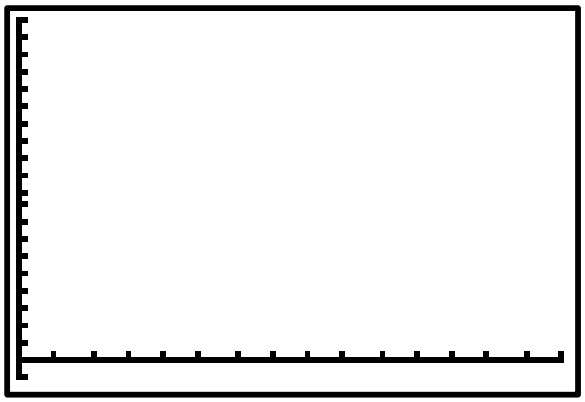
6. What conclusions can you make about the preferences of our class for the survey topic assigned to your group?
   Answer: Varies with student data. It is important to make sure that students not read more into the data than is appropriate.

7. List some questions that can not be answered from your data summary.
   Possible answers:
   Would the results be different if we offered different selection choices?
   We don't know <u>why</u> students answered the way they did.
   We don't know what "other" encompasses.

Key: **Worksheet 2 (Page 2 of 2)**

8. Can you make any predictions about the general preferences of the students in this school based on your survey results? Address the limitations to making broad generalizations based on this survey.
   Answer: Answers will vary with data. Limitation factors: sample size, random survey, our class may only include one age group.

9. Look at the second survey results. Tabulate the results of the survey. Display the results as a histogram on a TI-83. Sketch your results. Be sure to label and scale the axes.
   Answers will vary with student data. Look for labels and scaling.



10. Calculate the central tendency measures for your data.
    Varies with student data.

11. If you told 3 different people one of each of the three central tendency measures, would they be able to make the same conclusions about the data?
    Answers vary with data.
    a. If not, why are the measures so different?
    Answers vary with data. Highlight the effect of outliers and range of data.
    b. Which do you think is a most accurate representation?
    Answer: Varies with data. Consider which measure reflects how most respondents answered?

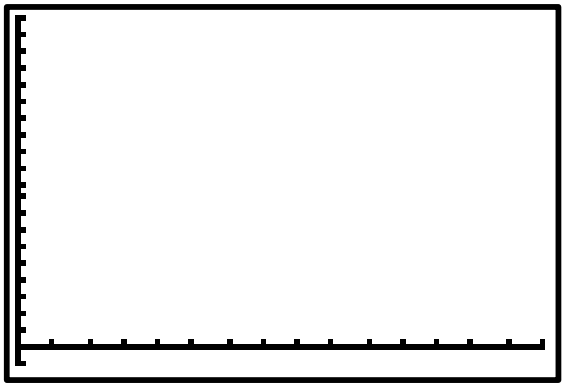
12. List information related to this data that you cannot determine from this data.
    The reasons behind the results.
    If students measured properly (pencil survey).
    If data is correlated.

13. What conclusions or predictions can you make after analyzing the data summary?
    Varies with data.

Overhead Master
Summary of *P*- and *N*- Surveys from Worksheet 2

1. **Preference Survey:**

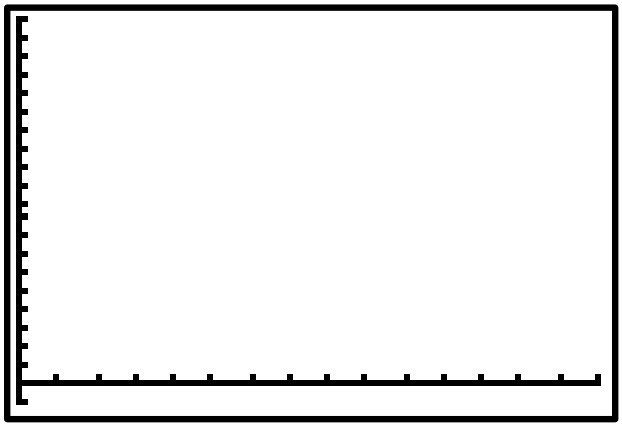
   Our bar graph:



   Conclusions we made:

2. **N-Survey:**

   Histogram:



3. **Measures of central tendency:**

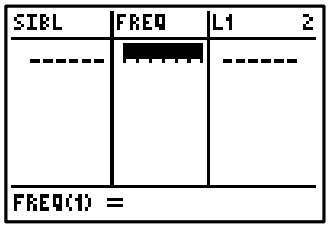
   Conclusions we made:

Directions for Graphing a Histogram Using the TI-83. (Using a sibling survey example)

1. Clear any equations: Press **Y=**. Clear any equations by pressing **CLEAR** on each line that has an equation.

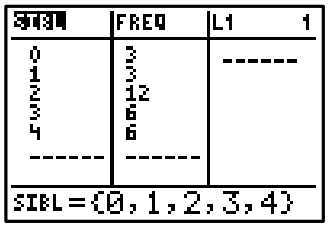
2. In this step you will record your results in 2 lists. Press **STAT**. There are three options along the top of the screen and EDIT is highlighted. Press **ENTER** to edit a list
   a. The cursor is now in List L1. The first list you set up will be a list of all of the results. In the sibling example the list will be the number of siblings a student has (0, 1, 2, 3, 4, etc.). You can name your own list: press **2nd INS.** Type in a name. In this example the list name is SIBL for siblings.
   b. The second list is the frequency of each response. Set up this list: 2nd **INS.** Type the name **FREQ**. Your screen should look like **Figure 1:** (An optional method is to simply enter each survey result directly from the board and let the calculator tabulate the frequency. In this case, do not use the FREQ list.)

Figure 1



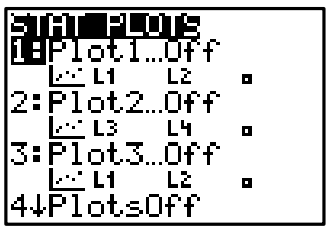
3. Now enter your data by entering data on a line and then pressing enter. You can move to the next list by pressing the left or right arrow key. Be sure that the frequency count corresponds to the appropriate survey result number. In this example there were three students with 0 siblings, 3 students with 1 sibling, etc. See **Figure 2.**

Figure 2



4. Now you are ready to graph your data. Type **2nd STAT PLOT**. Your screen should look like **Figure 3**.

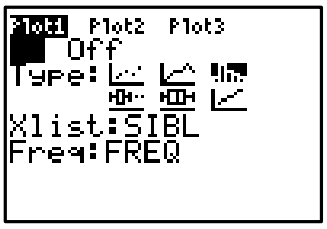
Figure 3



Directions for Graphing a Histogram (Page 2 of 2)

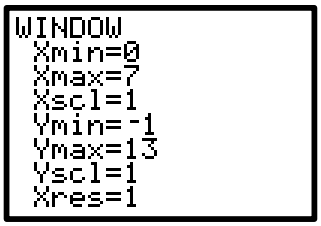
5. Press **ENTER**. Now you are on the PLOT screen.
   a. Press ENTER to turn PLOT1 on.
   b. Press the ↓ to the TYPE line. Select the histogram graph by pressing the → twice and then ENTER.
   c. Press the ↓ to the XLIST line. Type the name of your data list.
   d. Press the ↓ to the FREQ line. Type the name of your frequency list (FREQ).
   e. Your screen should look like **Figure 4** except for the name of your XLIST. (If you let the calculator compute the frequency, then the Frequency field will default to 1.)

Figure 4



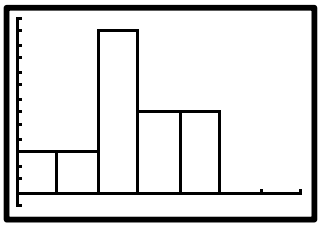
6. Before displaying the graph, set up a reasonable window. In this case the x range is 0 – 4 and the y range is 0 – 12. A good scale value for this data is 1 unit. See **Figure 5.**

Figure 5



7. Now press **GRAPH**. See **Figure 6**.

Figure 6



Worksheet 3

Survey Information Worksheet

Each student in your group will sample 10 people under the age of 20. You will put the results into the table below. Tomorrow you will combine your results into one table.

Type of Music (Select one from choices below.)	**When do you listen? Morning, Afternoon, or Evening?**	**How many times per month do you shop at:** **Store 1___ Store 2____**	**Estimate the $ amount spent at each store last month.** **Store 1___ Store 2___**		

Choices of types of music:

1. _____ 2. _____ 3. _____ 4. _____

5. _____ 6. _____ 7. _____ 8. _____

Worksheet 4 (Page 1 of 2)

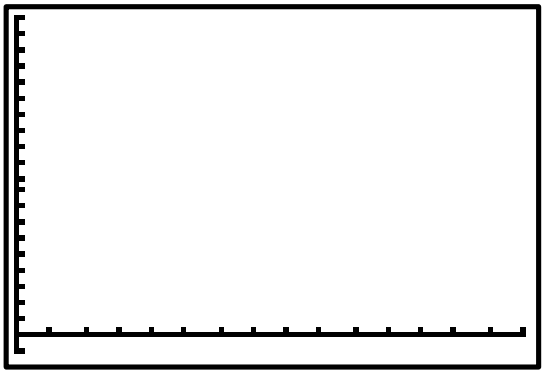
Data Analysis of Your Unit Project

Using the information you have gathered, answer each of the following as a group.

1. Using your gathered information, make a circle graph representing the percentages of each music preferences.

2. What is the total number of people surveyed?

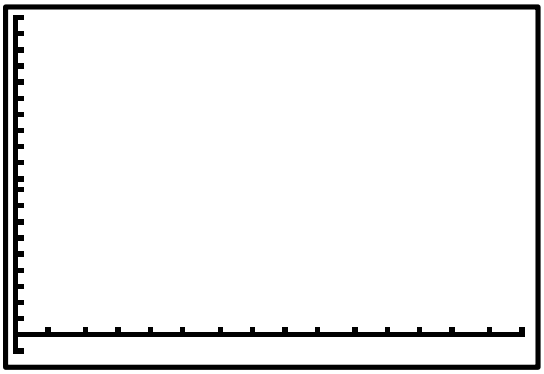
3. Make a bar graph with the same information you used for the circle graph.



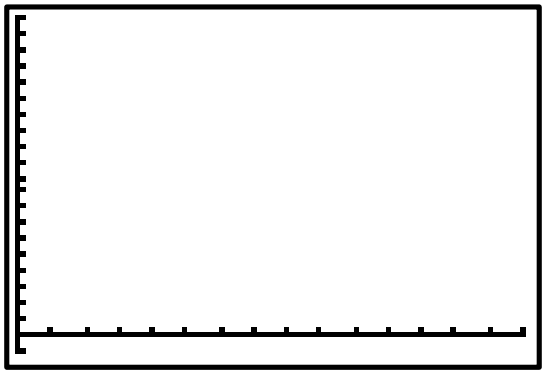
4. How can you use a circle graph to determine the number of CDs of each type of music the radio station should purchase? (Remember the station can only purchase 200 CDs initially.)

5. Make a histogram for the amount of money spent at each store and for the number of visits to:
   A. Store 1

Money Spent

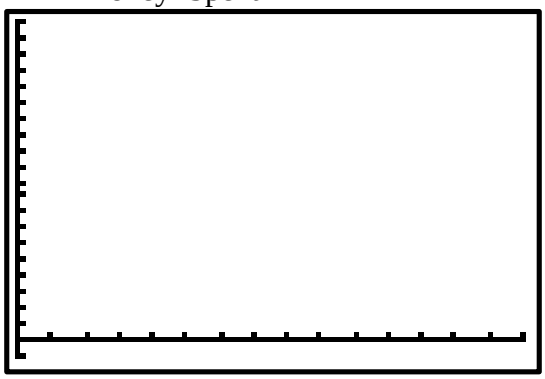


Number of Visits

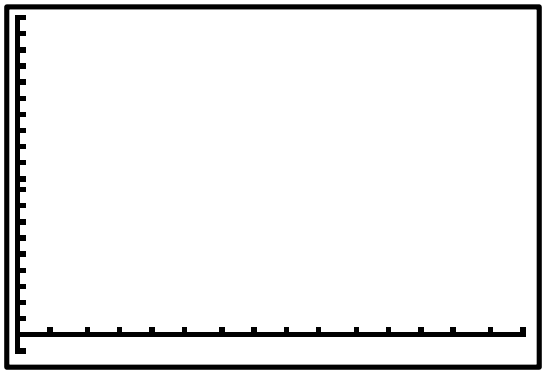


B. Store 2

Money Spent



Number of Visits



6. What was the time slot with the most listeners? Why is this important to the radio station management?

7. Find the central tendency for the amount spent at each store and the number of visits to:

   A. Store 1

   B. Store 2

8. Which central tendency best represents what students are spending at Store 1 and Store 2? Why?

9. Which central tendency would you use to persuade the stores to advertise? Explain why you chose this tendency.

10. Using your data, estimate how much the entire student body would spend in one month.

11. Are these retail stores good choices for ads? Justify your answer.

Key: **Worksheet 4** (Page 1 of 2)

Using the information you have gathered, answer each of the following as a group.

1. Using your gathered information, make a circle graph representing the percentages of each music preferences.

   Look for computation of percents and correct amount of circle for each. Answers will vary.

2. What is the total number of people surveyed? **40 per group**

3. Make a bar graph with the same information you used for the circle graph.

   Answers will vary. Check that percents are same in bar graph as in circle graph.

4. How can you use a circle graph to determine the number of CDs of each type of music the radio station should purchase? (Remember the station can only purchase 200 CDs initially.)

   Compute the percent of types of music. Multiply percent by 200.

5. Make a histogram using the graphing calculator for the amount of money spent at each store and for the number of visits to:

   A. Store 1

      Answers will vary. Data should represent numbers on survey.

   B. Store 2

      Answers will vary. Data should represent numbers on survey.

6. What was the time slot with the most listeners? Why is this important to the radio station management?

   Answers will vary. It is important because the station can charge more during peak listening time.

7. Find the central tendency for the amount spent at each store and the number of visits to:

   A. Store 1

      Answers will vary based on survey results.

   B. Store 2

      Answers will vary based on survey results.

8. Which central tendency best represents what students are spending at Store 1 and Store 2? Why?

   It depends on outliers and frequency.

9. Which central tendency would you use to persuade the stores to advertise? Explain why you chose this tendency.

   The measure with the greatest numerical value would best support the argument that students will spend money at a store.

10. Using your data, estimate how much the entire student body would spend in one month.

    The average spent per person in survey x total number of students. Answers vary with data.

11. Are these retail stores good choices for ads? Justify your answer.

    Answers will vary. Students should decide how many visits are already made to the stores and how much money is being spent. Are these stores that students will shop at and is it feasible for students to spend more money at these stores?

Performance Assessment

Teacher's Guide:

Introduction

The purpose of the assessment activity is to determine whether students learned the concepts that were taught. This assessment should be given at the end of this learning unit.

Objectives Covered

Students will:

- calculate the mean, median, and mode from a set of data.
- use mean, median, and mode to make predictions and recommendations.
- express limitations of data summaries and statistics.

Tools/Materials Needed for Assessment

- Pencil
- Graphing calculator
- Data Summary from unit project

Administering the Assessment

There are two portions to this assessment. Students should complete the assessment independently. They should record their answers directly on the assessment sheet. The scoring key (SR) and rubrics (BCR and ECR) are included. Part one must be done with no notes or data and must be turned in before teacher gives out Part two. Part two will use data summary from the unit project.

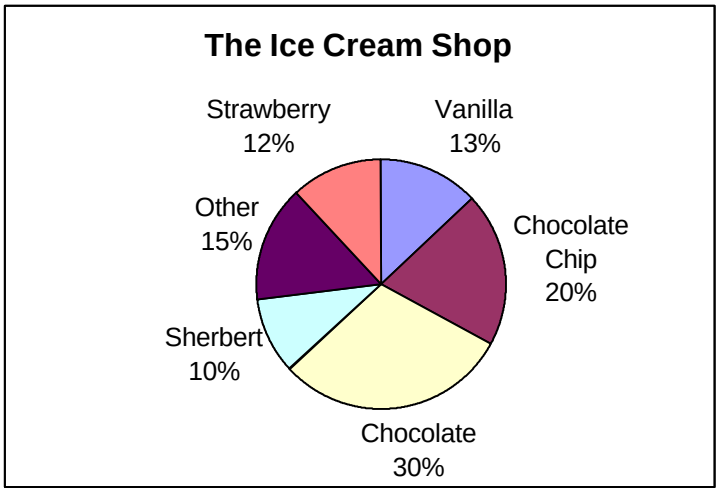
Assessment

Student Response Sheet
Data Analysis Assessment Task

Name: _____ Date: _____

Part 1:

The circle graph below shows ice cream consumption for IKE'S ICE CREAM over the past year. Use the following graph to answer questions 1-3.

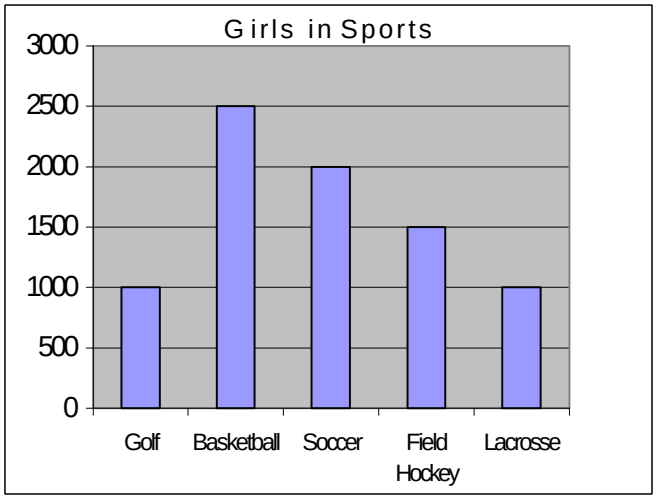


1) Explain how this information can help IKE'S ICE CREAM to order the correct amount of ice cream flavors for next year.

2) Midget Grocery purchases its ice cream from IKE'S ICE CREAM. If Midget Grocery's had to stock their shelves with 150 cartons of ice cream, how many cartons of vanilla should they purchase to satisfy the order.

3) Which of the following can you conclude from the graph:
   a) 15% of the population likes coffee ice cream.
   b) 30% of the population likes chocolate yogurt.
   c) 20% of the population likes chocolate chip.
   d) 50% of the population likes chocolate, vanilla, and strawberry.

For questions 4 and 5, use the following graph:



4) The mean number of girls in all sports in the above graph is
   a) 2000
   b) 1600
   c) 1700
   d) 1000

5) In the above graph what girls sport has the highest population.
   a) Golf
   b) Soccer
   c) Basketball
   d) Lacrosse

6) Your math test scores for the semester are listed below. Would you like your final grade for the class to be based on the mean, median, or mode of the scores? Justify your answer.
   Scores: 65, 85, 92, 74, 94

7) The teacher is giving you another test. If you want your grade for the class to equal 85 based on the mean of the test scores, what must you score on that test?
   a) 88
   b) 100
   c) 85
   d) 95

Performance Part 2

The radio station from the data analysis project needs advertising from retailers to generate revenue. Using the data your group gathered, summarized, and analyzed, write a persuasive letter to the management of the best of Store 1 or Store 2 convincing the management of that store to buy advertising time from the radio station.

Each of the following should be included as support for your position:

a) The most appropriate data display.
b) At least one measure of central tendency to help convince the merchant to purchase advertising time.
c) Justification for why that tendency shows that the merchant would benefit by advertising.
d) Suggestion on the time of day that the merchant may most benefit by advertising.

Assessment

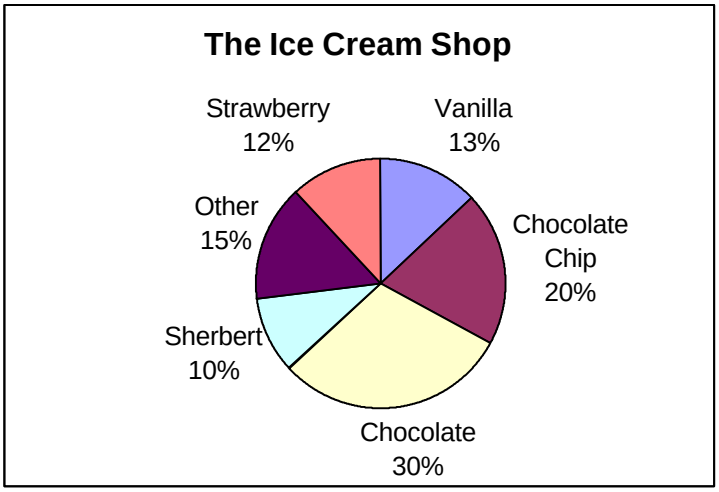
Scoring Guide

Data Analysis Assessment Task

Name: KEY Date: _____

Part 1:

The circle graph below shows ice cream consumption for IKE'S ICE CREAM over the past year. Use the following graph to answer questions 1-3.



1) Explain how this information can help IKE'S ICE CREAM to order the correct amount of ice cream flavors for next year. **Answers will vary**

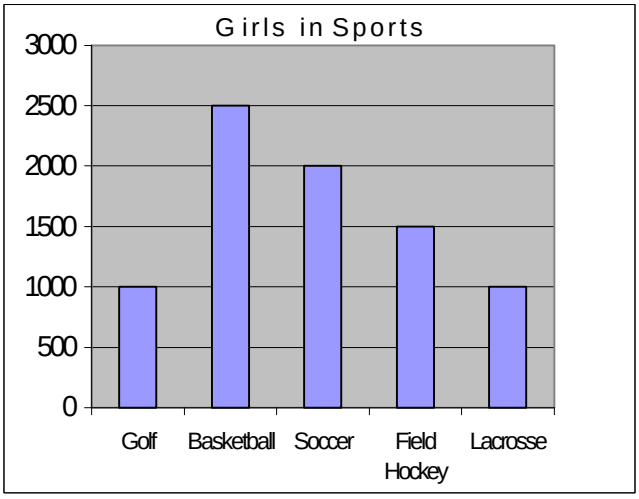
Rubric
3- explanation is convincing and correct
2- explanation underdeveloped
1-all other responses
0-blank paper

2) Midget Grocery purchases its ice cream from IKE'S ICE CREAM. If Midget Grocery's had to stock their shelves with 150 cartons of ice cream, how many cartons of vanilla should they purchase to satisfy the order. **19.5**

Rubric
2-correct answer
1-incorrect answer
0-all other responses

3) Which of the following can you conclude from the graph:
   a) 15% of the population like coffee ice cream.
   b) 30% of the population like chocolate yogurt.
   c) 20% of the population like chocolate chip.
   d) 50% of the population likes chocolate, vanilla, and strawberry.

For questions 4 and 5, use the following graph:



4) The mean number of girls in all sports in the above graph is
   a) 2000
   a) 1600
   b) 1700
   c) 1000

5) In the above graph what girls sport has the highest population.
   a) Golf
   b) Soccer
   c) Basketball
   d) Lacrosse

6) Your math test scores for the semester are listed below. Would you like your final grade for the class to be based on the mean, median, or mode of the scores? Justify your answer.
   Scores: 65, 85, 92, 74, 94 **mean = 82, median = 85, mode = None**
   Rubric
   4-central tendency are correct with acceptable explanation
   3-central tendency are correct with incomplete explanation
   2-two of the three central tendency with incomplete explanation
   1-all other responses
   0-blank paper

7) The teacher is giving you another test. If you want your grade for the class to equal 85 based on the mean of the test scores, what must you score on that test?
   a) 88
   b) 100
   c) 85
   d) 95

Rubric for Assessment Part 2

4 The letter is persuasive and supports the radio station management's position that the merchant would benefit by buying an advertisement from the radio station. An appropriate data display and measure of central tendency is used. The letter explains how central tendency justifies the ways retailers would benefit by an advertisement. The letter writer suggests a time of day when retailer may benefit most.

3 The letter is persuasive. Either an appropriate data display or the appropriate measure of central tendency supports the request from radio management for the retailer to purchase an advertisement. Justification is present about why the data display or the central tendency shows that the retailer would benefit from an ad. An appropriate time to run the ad is included.

2 The letter does not fully persuade the merchant to buy an advertisement. At least one data display or one measure of central tendency is present, but it is inappropriate. The letter does not show how the merchant benefits by the advertisement. The time suggested is inappropriate or unclear.

1 The letter does not persuade the merchant to buy an advertisement. There is no data display and no measure of central tendency. No suggestion is made about the time of day that the advertisement would be most beneficial.

0 The page is blank or missing or has no information pertaining to the assessment question.